2. ALDROVANDA -- Young guppies can be bred for this genus by placing adult fish in an aquarium in a ratio of one male to three females. As the fish are live bearers, the new young editions can be prevented from being eaten by their parents by the installation of a breeding trap, from which the young fry can be removed as required to be placed in the Aldrovanda tank. However, don't be tempted to place too many fry into the tank at once as at a certain age they will be able to attack and eat the very plant you are trying to feed. The above can be used successfully with the Utric species which have large bladders If one can maintain a minimum temperature of 24° C., guppies can also be bred throughout the year supplying a much needed food source when many others are scarce. Also try Brine shrimp which can be obtained in egg form from your local aquarists shop.

3. GENLISEA -- The infusoria culture is ideal for this small plant. Try adding a few drops to its growing medium every so often.

4. ZOOPHAGUS -- The tiny animal called Rotatoria on which this plant particularly feeds should easily be found in pond water after examination under a microscope.

5. ENDOCAHLEUS -- This fungus lives by attacking amoeba which it eventually kills. A regular supply of amoeba can be obtained by scooping up a small quantity of the bottom mud of a pond in a wide-necked bottle. If any amoeba are present in this mixture, they wi after several days show up as minute gray dots (only just seen by the naked eye) on glass slides. As these one-celled animals live on such life as diatoms and minute green algae, a pond known to be rich in these can supply an ideal food source to breed the creature.

REFERENCES

The Freshwater Aquarium	R. F. O'Connell
Observers Book of Pond Life	John Clegg
Freshwater Life	John Clegg
Carnivorous Plants	Randall Schwartz
Insectivorous Plants	Charles Darwin

DIGESTION PROCESS OF DIONAEA MUSCIPULA AS ANALYZED WITH KIRLIAN PHOTOGRAPHY

by William C. Leikam and Don S. McNeil

Kirlian photography involves the contact exposure of an object with high voltage, not lenses and light. The result is a visible flaring emission pattern extending from the object across the film. This pattern changes in consistent ways as internal changes withi the object occur. Such changes might be the emotional state of a person, or the physical condition of a plant, i.e., its state of health. This flare pattern is known by researchers such as Dr. Thelma Moss of U.C.L.A. as the corona.

It was upon this basis of consistent change in the corona that we wondered what changes might become evident upon comparing a series of Kirlian photographs in Dionaea as it proceeded through the digestive process. If we could perceive these concrete changes we surmised that we could then "see" the energy transformations which accompany the digestive function and, therefore, possibly learn something about the digestive cycle. From this information we could then draw several very tentative conclusions about the varying expenditures of energy created and used by the plant, thus allowing us to "see" where peak energy was being produced by the trap in order to further digestion.

DISCUSSION

During our search we ran a double series. Figures 2 and 3 are from series B while figures 1 and 4 are from series A. Each photograph was taken at 24 hour intervals save for figures 1 and 2. Although the photographs actually shown here are from two series, they accurately reflect what was found in each independent sampling.

Thus, figure 1 shows an open trap which was empty but was triggered and closed while in the high voltage field. This figure is used as our baseline for comparison with all successive photographs. Note that the corona in figure 1 is rather mottled through the central region of the trap with a weak corona extending outward on the perimeter. This is characteristic of the energy level, as shown by the corona, while the trap closes without the presence of an insect. Figure 2, however, shows the series B trap within two minutes of closure on a severed common meal worm. Here there is a sudden "exploding" of the corona, but note also that this does not occur evenly about the trap. This unevenness indicates that the greatest flow of energy within the trap region is not evenly distributed, thus possibly suggesting that certain parts of the trap are, at the outset, more immediately and actively involved in both the closure and initial digestive stages than are other areas of the trap and/or that the trap here is seen adjusting to internal stress

KIRLIAN PHOTOGRAPHY

Dionaea muscipula

(See text for discussion of figures)

W. C. Leikam

D. S. McNeil

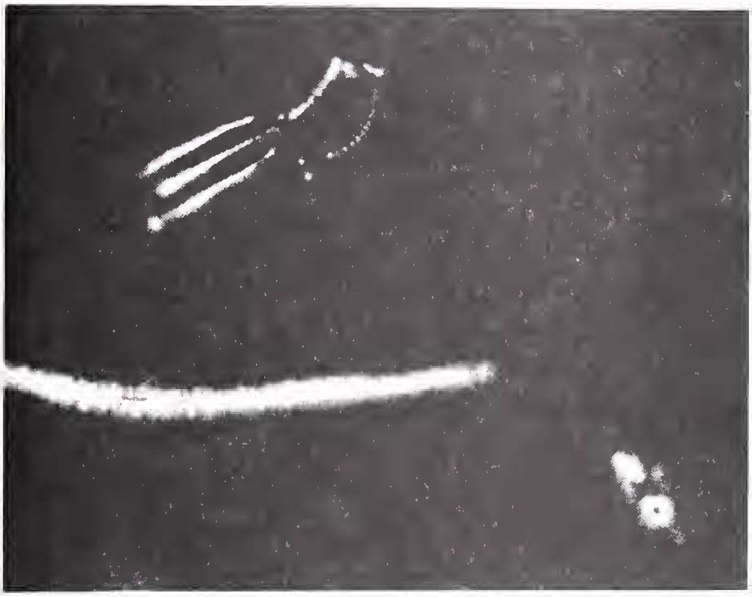
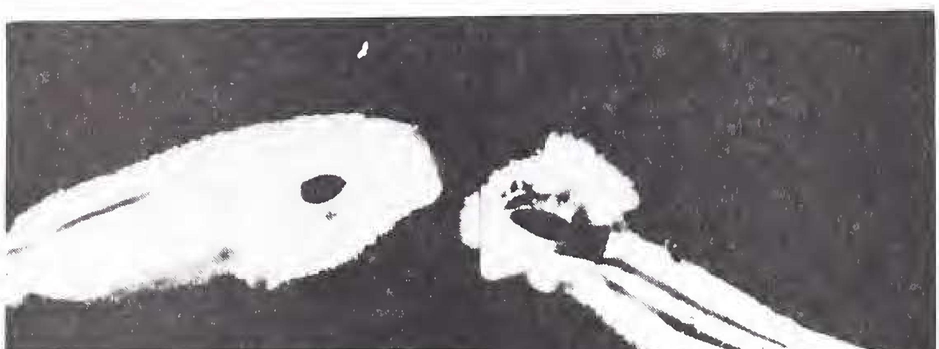


Figure 1



Figures 2A and 2B

Figure 3

Figure 4

At 24 hours into the process (figure 2A) there occurs a tremendous flow of energy which envelops the total trap and stem in a bright, white corona. This may indicate that at 24 hours into the digestive process the plant is well into its peak activity, thus confirming others' research that there is a large outpouring of enzyme activity and greater cell action occurring in this early stage.

Figure 3, at 36 hours post-closure, shows another change in the corona as compared with figure 2 in that the energy appears to be refocusing itself into the trap and decreasing in the stem. This pattern continues as the process reaches approximately halfway through digestion. However, it should be noted that even as the corona diminishes the total trap and stem begins to take on a freshness, a clarity of detail that is not seen in figure 1. This may indicate three things: (1) that the internal energy needed for digestion occurs with a tremendous and sudden burst which lasts for a period of days and then declines, (2) that actual absorption may not begin until several days after closure, and (3) that apparently the energy needed for digestion and closure once accomplished by the plant then takes on the characteristics of fading which imples that the plant produces very little, if any, new digestive enzymes after about two or three days.

Thus, we see in figure 4, taken just under 24 hours prior to opening, a fully renewed, well fed, and highly refined corona being produced by Dionaea as it returns to its waiting and open state. It is interesting to note the increased vigor in the corona of figure 4, the precise and superbly organized patterns both internally within the trap and externally, indicating a healthy flow of new energy moving throughout the plant. Even a well fed plant reflects the joy of a good meal. And so, here, for the first time as far as we are aware, is a photograph of the energy transformation of a meal worm converted to useful food for the plant.

FINAL NOTE

In doing research with Kirlian photography it is of major importance that the researcher list the materials used and the type of equipment involved, since any change in one of these dimensions will produce variable results. Thus, if another researcher were to check our results the following information would be absolutely necessary:

1. Instrument used: Edmunds Kirlian Photography Unit with modifications.
2. Film: Kodak Ortho Safety Film #3.
3. Exposure Time: 15 seconds.
4. Voltage: High.
5. Photographing Interval: 24 hours per take.
6. Room Temperature: 68-70° F.
7. Humidity: Moderate and constant.
8. Specimen: *Dionaea muscipula*.
9. Digestive Material: Common meal worm, severed.

SPECIAL NOTICES

STEPHEN WILLIAMS recently published his manuscript titled: "Comparative Sensory Physiology of the Droseraceae--the Evolution of a Plant Sensory System." This manuscript is 18 pages in length and will be published in the Proceedings of the American Philosophical Society. Dr. Williams has made available to CPN members copies of this paper. To offset just his mailing and reproduction costs, he has asked that he be sent 60¢ for each reprint without a cover and 85¢ for a reprint with a cover. This paper deals with the anatomy and function of four genera of CP, namely: *Drosophyllum*, *Drosera*, *Dionaea* and *Aldrovanda*. Foreign subscribers should add another 40¢ postage for surface mailing. Please send orders to: Dr. Stephen E. Williams, Lebanon Valley College, Department of Biology, Annville, PA 17003. Do NOT send orders to the co-editors.

REGARDING BACK ISSUES of CPN being reprinted and sold by Leo Song as described in the last issue of CPN (p.34), please make all checks for purchase payable to ARBORETUM FOUNDATION FUND and not personally to Leo. See the last issue for price and ordering information.

For those of you who are wondering what is happening to your order for *Plants of Prey* by Rica Erickson from International Scholarly Book Services, Inc., I should tell you that they are coming after a long delay. A recent call revealed several things. First, the new address is: P. O. Box 555, Forest Grove, Oregon 97116. Their telephone number is (503) 357-7192. At the present time, the CP book *Plants of Prey* is not in stock but a new shipment is expected to arrive any day which will take care of all back orders and provide sufficient copies for new orders. The new price is $10.00 postpaid. All orders must be prepaid and bank drafts in U.S. funds are necessary for foreign orders.

For those of you who are interested in ordering reprints of articles from the journal *Australian Plants* which we mentioned in CPN V, 23, 1976, the issues come fully bound in one volume set. They are $6.00 plus postage in Australian currency. Write to: Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213 Australia.